

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

552, 429  
REC'D 23 NOV 2005

WIPO

PCT

Applicant's or agent's file reference P26,229A PCT		FOR FURTHER ACTION		See Form PCT/IPEA/416																
International application No. PCT/US04/10861		International filing date (day/month/year) 08 April 2004 (08.04.2004)	Priority date (day/month/year) 09 April 2003 (09.04.2003)																	
International Patent Classification (IPC) or national classification and IPC IPC(7): H01L 23/485 and US Cl.: 156/73.1																				
Applicant KULICKE & SOFFA INVESTMENTS INC.																				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>3</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> (sent to the applicant and to the International Bureau) a total of ___ sheets, as follows:</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <table border="0"> <tr> <td><input checked="" type="checkbox"/> Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/> Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/> Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/> Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/> Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/> Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/> Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/> Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>					<input checked="" type="checkbox"/> Box No. I	Basis of the report	<input type="checkbox"/> Box No. II	Priority	<input type="checkbox"/> Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/> Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/> Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/> Box No. VI	Certain documents cited	<input type="checkbox"/> Box No. VII	Certain defects in the international application	<input type="checkbox"/> Box No. VIII	Certain observations on the international application
<input checked="" type="checkbox"/> Box No. I	Basis of the report																			
<input type="checkbox"/> Box No. II	Priority																			
<input type="checkbox"/> Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability																			
<input type="checkbox"/> Box No. IV	Lack of unity of invention																			
<input checked="" type="checkbox"/> Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement																			
<input type="checkbox"/> Box No. VI	Certain documents cited																			
<input type="checkbox"/> Box No. VII	Certain defects in the international application																			
<input type="checkbox"/> Box No. VIII	Certain observations on the international application																			
Date of submission of the demand 04 November 2004 (04.11.2004)		Date of completion of this report 10 November 2005 (10.11.2005)																		
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201		Authorized officer James Sells Jean Proctor Paralegal Specialist Telephone No. (703) 308-0651																		

Form PCT/IPEA/409 (cover sheet)(April 2005)

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/US04/10861

## Box No. I Basis of the report

1. With regard to the language, this report is based on:

- ☒ the international application in the language in which it was filed.
- ☐ a translation of the international application into English, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
- ☐ publication of the international application (under Rule 12.4(a))
- ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

- ☒ the international application as originally filed/furnished
- ☒ the description:
- pages 1-19 as originally filed/furnished
- pages\* NONE received by this Authority on \_\_\_\_\_
- pages\* NONE received by this Authority on \_\_\_\_\_
- ☒ the claims:
- pages 20-24 as originally filed/furnished
- pages\* NONE as amended (together with any statement) under Article 19
- pages\* NONE received by this Authority on \_\_\_\_\_
- pages\* NONE received by this Authority on \_\_\_\_\_
- ☒ the drawings:
- pages 1-4 as originally filed/furnished
- pages\* NONE received by this Authority on \_\_\_\_\_
- pages\* NONE received by this Authority on \_\_\_\_\_
- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (specify): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (specify): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (specify): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (specify): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

Form PCT/IPEA/409 (Box No. I) (April 2005)

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/US04/10861**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

## Novelty (N)

Claims 4-9,13-23,27-37 YESClaims 1-3,10-12,24-26,38 NO

## Inventive Step (IS)

Claims 4,5,18,19,21,32,33,35 YESClaims 1-3,6-17,20,22-31,34,36-38 NO

## Industrial Applicability (IA)

Claims 1-38 YESClaims NONE NO**2. Citations and Explanations (Rule 70.7)**

Claims 1-3, 10-12, 24-26 and 38 lack novelty under PCT Article 33(2) as being anticipated by Ramm (WO-A-0101478).

Ramm discloses a structural element and a method for manufacturing structural elements. This system involves forming an inter-metallic connection in wire bonding which employs CuN in the manner claimed by the applicant. See page 3, line 13 through page 6, line 27 and claims 9 and 19.

Claims 6-9, 13-17, 20, 22, 23, 27-31, 34, 36 and 37 lack an inventive step under PCT Article 33(3) as being obvious over Ramm (WO-a-0101478) as described above in view of Aoka et al (US 2002/0155702).

Aoka et al discloses forming a barrier layer of CuN on a copper interconnect by use of a nitrogen-containing plasma. See paragraph 61. It would have been obvious to one having ordinary skill in the art to employ a nitrogen-containing plasma, as taught by Aoka et al, in the system of Ramm in order to facilitate manufacture of the structural elements. In addition, without the disclosure of unexpected results, it is the examiner's position that the specific plasma and sputtering technique are well known and conventional in the art and would have been obvious to employ in the system of Ramm as a matter of design choice based upon desired physical properties of the articles being manufactured.

Claims 4, 5, 18, 19, 21, 32, 33 and 35 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the step of actively forming an oxide layer on the copper interconnect prior to formation of the CuN layer.

Claims 1-38 meet the criteria set out in PCT Article 33(4), and thus meet industrial applicability because the subject matter claimed can be made or used in industry.

----- NEW CITATIONS -----